

REMARKS/ARGUMENTS:

Claims 13-15, 18-20, 23-37, 39, and 40 are amended. Support for the amendments to claims 13 and 34 can be found at p. 13, lines 12-24 and p. 5, lines 9-15. Support for the amendment to claim 18 can be found at p. 22, line 20-p. 23, line 11 of Applicant's specification. New claim 41 is added. Claims 13-15, 18-20, 23-37, and 39-41 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The invention relates to a dry etching apparatus, a dry etching method, and a cleaning method adopted in the dry etching apparatus, and more particularly to a dry etching apparatus, a dry etching method, and a cleaning method adopted in the dry etching apparatus suitable for use in texturing the surface of a silicon substrate used in a solar cell or the like. (Applicant's specification, at p. 1, lines 9-14).

CLAIM OBJECTIONS:

Claim 13 stands objected to because according to the Office in line 6, "forming fine fixtures" should read --forming fine textures--. In response, the Applicant amended claim 13 in the manner suggested by the Office. Withdrawal of this objection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102:

Claims 13, 14, 18, 19, 23-27, 30, 32-36, and 39 stand rejected under 35 U.S.C. 102(b) as being anticipated by Terakado et al. (U.S. Patent No. 5,254,215).

Claims 13-15, 18, 19, 23, 25, 26, 30, 32-34, 36, 37, and 39 stand rejected under 35 U.S.C. 102(b) as being anticipated by Cuomo et al. (U.S. Patent No. 4,523,971).

Claims 13, 14, 18, 19, 30, 31, 34, 36, 39, and 40 stand rejected under 35 U.S.C. 102(b) as being anticipated by Powell (U.S. Patent No. 5,015,331).

The Applicant respectfully traverses the above rejections. Claim 13, as amended, is as follows:

A method for producing a solar cell comprising:

placing a substrate for a solar cell on an RF electrode provided inside a chamber, directly or through a tray;

covering said substrate with a plate, wherein said plate comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate; and

forming fine fixtures textures on a surface of said substrate by using residues being chiefly composed of components of said substrate as an etching mask.

The cited references cannot anticipate or render claim 13 obvious, because the cited references fail to teach or suggest "covering said substrate with a plate, wherein said plate comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate; and forming fine fixtures textures on a surface of said substrate to be etched by a reactive ion etching method; wherein said plate comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate by using residues being chiefly composed of components of said substrate as an etching mask."

In claim 13, the reason why the residue can function as an etching mask is that the required plate inhibits a part of ions and traps residue in a space between the plate and the substrate (Applicant's specification, at p.21, lines 11-21).

The Office states "a mask so placed will inherently function in the same manner as the claimed masked" (Office Action, at p. 5, lines 10-11). However, Applicant respectfully submits that the cited references fail to teach or suggest

etching the substrate by using residues that are composed from the substrate as an etching mask.

For example, in Fig. 2 of Terakado which denotes a substrate to be etched, the etched portion is not covered by the mask. Consequently, the "residue" cannot be trapped at that portion.

In Cuomo, the grids 34 and 35 in Fig. 1 do not function as a mask to the substrate. Cuomo at column 4, lines 49-53, states, "Rather than requiring a masking layer over substrates 46, the present invention provides a patterned ion beam which can be used to surface treat, etch, or deposit onto selected locations of substrate 46." Therefore, residue cannot be trapped on the substrate by use of the grids 34 and 35.

In Powell, the lower electrode and the grid are at the same potentials. Consequently, the acceleration of the ions toward the substrate is removed. Therefore, the present invention provides more of a chemical reaction type of etching. This chemical type of etching results in a much more selective etch between the mask and substrate layer. (Powell, column 4, lines 48-54). In one example, silicon nitride that was deposited on a substrate was etched using plasma enhanced chemical vapor deposition. (Powell, column 4, line 56-59). In a second example, an etch was performed on low vapor pressure chemical vapor deposition silicon nitride. (Powell, column 5, lines 13-15). In a third example isotropic, phosphorus and boron doped oxide was etched. (Powell, column 5, lines 42-44). In these examples, fine fixtures textures are not formed on a surface of the substrate by using residues being chiefly composed of components of said substrate as an etching mask.

In light of the foregoing, Applicant respectfully submits that the cited references could not have anticipated or rendered claim 13 obvious, because the

cited references fail to teach or suggest each and every claim limitation. Claims 14, 15, and 23-28 depend from claim 13 and cannot be anticipated or rendered obvious for at least the same reasons as claim 13.

Independent claim 34 and its dependent claims 35-37, 39, and 40 similarly, require “forming fine textures on a surface of said substrate by using residues being chiefly composed of components of said substrate as an etching mask” and are therefore, patentable over the cited references for the reasons discussed above. Withdrawal of these rejections is thus respectfully requested.

Claim 18, as amended, is as follows:

A method for producing a solar cell, comprising:
placing a substrate on an RF electrode provided inside a chamber, directly or through a tray;
covering said substrate with a plate provided with a number of opening portions; and
etching the substrate by a reactive ion etching method;
wherein fine textures are formed on a surface of said substrate and said plate is cleaned on a surface side concurrently.

The cited references cannot anticipate or render claim 18 obvious, because the cited references fail to teach or suggest “said plate is cleaned on a surface side concurrently.”

In the present invention, as residue is trapped between the plate and the substrate, and attached to the plane A of the plate 15, the plate is cleaned concurrently with etching of the substrate. (Applicant’s specification, at p. 22, line 20-p. 23, line 11).

Such a process is neither taught nor suggested by any of the cited references. The cited references do not trap residue between the plate and the substrate. Consequently, the idea of cleaning the plate is neither taught nor suggested by these references.

In light of the foregoing, Applicant respectfully submits that the cited references could not have anticipated or rendered claim 18 obvious, because the cited references fail to teach or suggest each and every claim limitation. Claims 32 and 33 depend from claim 18 and cannot be anticipated or rendered obvious for at least the same reasons as claim 18. Withdrawal of these rejections is thus respectfully requested.

Claim 19 depends from claim 20. Since the Office states, "Claim 20 is allowed," claim 19 is believed to be allowable for at least the same reasons as claim 20. Withdrawal of this rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 28 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over one of Terakado and Cuomo in view of Chung (U.S. Patent No. 6,316,289). The Applicant respectfully traverses this rejection.

Claims 28 and 29 depend from claim 13, and as such include all the limitations of claim 13, and therefore, cannot be rendered obvious over Terakado or Cuomo for at least the same reasons discussed above. Chung cannot remedy the defect of Terakado or Cuomo and is not relied upon by the Office for such. Instead, the Office cites Chung for teaching forming a standoff mask by laminating a plurality of spaced long members.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 28 and 29 obvious, because the cited

Appl. No. 10/650,505
Amdt. Dated February 13, 2007
Reply to Office Action of October 13, 2006

Attorney Docket No. 81872.0051
Customer No.: 26021

references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

ALLOWABLE SUBJECT MATTER:

Claim 20 is allowed.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

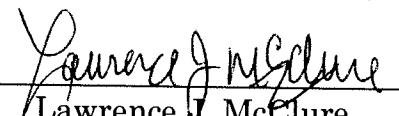
If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4755 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: February 13, 2007

By: _____


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